ECONOMIC COMMENTARY

Measuring the Value of Software and Research and Development Products in Alberta

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Highlights:

Only 1% of Canada's GDP can be contributed directly to research and development (R&D) and software. The true value of R&D to the economy is difficult to measure as they provide significant indirect value through support for the advancement of knowledge and innovation across industries. In Alberta, R&D and software development is primarily focused in five industries. While this allows Alberta to be a leader in a few industries, it also leaves room for Alberta to grow the development of R&D and software.

Alberta Government

Overview

Research and development (R&D) and software are information and communication technologies products which support increased productivity and innovation. R&D and software are primarily consumed as intellectual property product by businesses and governments, supporting both public and private innovations. The innovations identified through R&D and software development identify opportunities for increased productivity allowing for more effective use of resources. Innovations from R&D and software lead to increased diversification, technical understanding, and competitiveness.

Industries Producing R&D and Software

R&D and software are developed by many industries throughout the economy. The supply and demand of R&D and software can be used as an indicator of their economic value, although it does overlook some of the indirect value. The indirect value comes from supporting other goods and services, which both R&D and software do as tools for innovation. The 2012 input-output tables, released in November 2015, show the supply of R&D and software directly contributed $52.7 billion to the Canadian economy which is equivalent to 1% of all Canada made products. Of that $52.7 billion Alberta produced $6.7 billion dollars, approximately 13% of the Canadian total. In Alberta most R&D and software development comes from a few industries. Table 1 shows Alberta's main R&D and software producing industries, as well as the share of overall production of R&D and software in Alberta, and the Alberta share of the Canadian production by that industry.

Table 1: Alberta's largest producers of R&D and Software

	Top Producing Industries in Alberta	% of Alberta Overall Production	% of Canadian Industry Total
R&D	Government Services	45%	11%
	Professional, Scientific and Technical Services	20%	11%
	Mining, Quarrying and Oil and Gas Extraction	14%	55%
	Manufacturing	12%	8%
Software	Professional, Scientific and Technical Services	34%	9%
	Information and Cultural Industries	24%	12%
	Government Services	13%	10%
	Mining, Quarrying and Oil and Gas Extraction	8%	82%

Source: Statistics Canada Supply and Use Tables, published November 2015.

Government Services includes: Government education services, Other provincial and territorial government services, Other municipal government services, Government health services, Other federal government services, Other aboriginal government services

Table 1 shows that the majority of R&D and software from Alberta comes from five industries. For four of those industries Alberta produces close to 10% of the national total. For the final industry, Mining, Quarrying and Oil and Gas Extraction, Alberta represents 55% of R&D and 82% of software produced in Canada. This is in line with Alberta's overall national contribution, as Alberta produces roughly 50% of all Mining, Quarrying and Oil and Gas Extraction products in Canada.

In Alberta R&D and software are primarily used as intellectual property products consumed by businesses and government. Intellectual property products are defined as leading to knowledge that increases the benefit of production.[1] In Canada 80% intellectual property products comes from R&D and Software with the additional 20% from mineral and oil and gas exploration. This indicates that R&D and software are the main products used to support the advancement of knowledge for production.

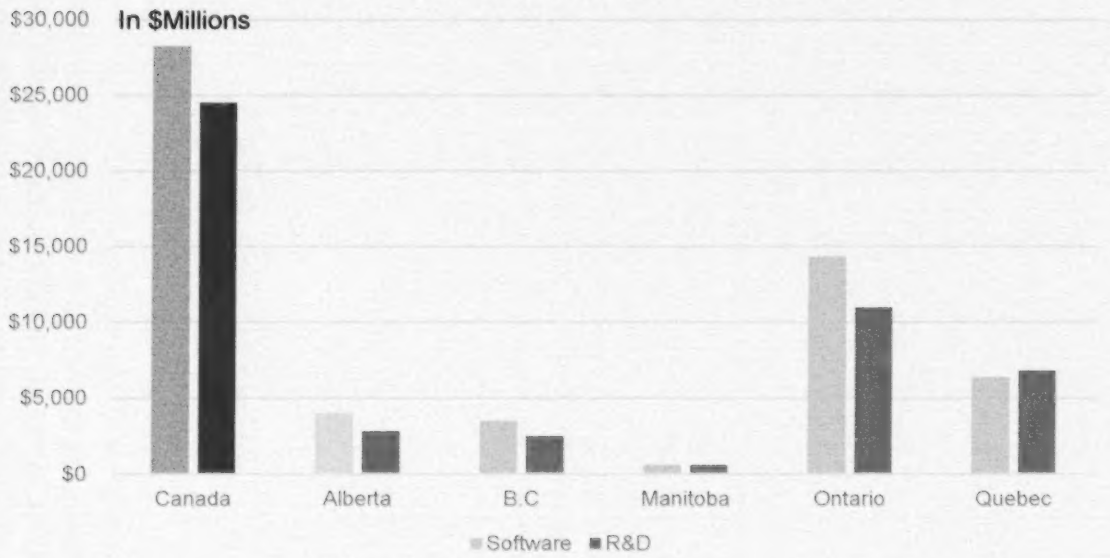
Statistics Canada's 2012 input-output tables show that exports from R&D and software represent 0.5% of all Alberta exports. Of the R&D produced in Alberta 15% was exported while none was imported, making Alberta a R&D net exporter. In the same year Alberta was a net-importer for software, importing $5 of software for every $1 exported. Exports and imports connect Alberta producers of R&D and software to the other markets within Canada and globally, providing a broader market for firms to trade with, reducing the impact of volatility in the local economy.

Provincial Share of R&D and Software Production and Exports

Looking at other provinces production of R&D and software provides information on where there development is focused in Canada. Chart 2 shows the total production of R&D and software in Canada, Alberta, and four comparison provinces. The chosen provinces are Manitoba, as a small producer of R&D and software, B.C, which produces a similar amount to Alberta, and Quebec and Ontario which are the national leaders.

[1] "System of Macroeconomic Accounts- Glossary, I" last modified July 25, 2016 http://www.statcan.gc.ca/eng/nea/gloss/gloss_i#Intellectualpropertyproducts

Chart 2: Gross Sales of Software and R&D in 2012



As chart 2 shows Alberta is not an overall provincial leader in R&D and software, but holds a reasonable market share. Quebec and Ontario together produce almost 3/4 of all R&D and software in Canada. Manitoba produces relatively little, making up only 2% of the Canadian total. B.C. is the most comparable to Alberta as both produce and consume between 10% and 15% of the national total. At the industry level Alberta is a provincial leader in certain industries such as mining, quarrying, and oil and gas extraction, utilities, and educational services for R&D and mining, quarrying, and oil and gas extraction, and other activities of the construction industry for software.

R&D and software are consumed internally by each provinces and but they are also traded interprovincially and internationally. The input-output table indicates that provinces generally export more R&D and software internationally than interprovincially. Alberta is the only province to export more R&D interprovincially then internationally, with approximately 2/3 of all Alberta produced R&D exported to other provinces. Despite higher interprovincial R&D exports Alberta reports no interprovincial R&D imports. Interprovincially Alberta's exports mainly go to are Quebec and B.C for R&D, and Ontario and Saskatchewan for software. As Alberta and B.C produce and consume similar levels of R&D and software B.C provides a counterpoint for comparing Alberta's export strength. For R&D, Alberta exports 50% more than B.C., but Alberta mostly exports R&D interprovincially so Alberta's international exports are 40% lower than B.C's. For software Alberta's exports are only equal to 25% of B.C.'s indicating that Alberta's software market does not have as strong a trade presence.

R&D and software are products consumed and produced by many industries. The level of connectedness, and the fact that both products support innovation, indicate that they are important to the productivity of the economy and help with increasing economic advancement. While Alberta

maintains a healthy level of production for both products there is still room for growth. Alberta's international trade for both R&D and software fall behind other provinces of similar size, increasing the trade can increase the market size.